

THE "Knowledge Diary and Scientific Handbook for 1903," issued from Knowledge office, is a compendium of scientific dates, facts and data which will be found useful to students in many departments of scientific work. In addition to a general astronomical ephemeris and a calendar of events of scientific interest for each month, the book contains six charts showing the movements of twelve of the principal planets during 1903, and twelve small charts which show the appearance of the heavens during each month. There are also many useful tables and several short articles, on practical work with the spectroscope, the observation of variable stars, systematic botany and other subjects.

OUR ASTRONOMICAL COLUMN.

ASTRONOMICAL OCCURRENCES IN JANUARY:—

- Jan. 2. 4h. 37m. Transit (egress) of Jupiter's Satellite IV. (Callisto).
 2-3. Epoch of Quadrantid meteoric shower (radiant $230^{\circ} + 52^{\circ}$).
 6. 4h. 33m. Transit (ingress) of Jupiter's Satellite III. (Ganymede).
 10. 8h. 41m. Minimum of Algol (β Persei).
 12. 19h. 20m. to 19h. 37m. Moon occults λ Geminorum (mag. 3.6).
 13. 5h. 30m. Minimum of Algol (β Persei).
 14. 8h. 14m. to 9h. 8m. Moon occults α Cancri (mag. 4.3).
 15. Illuminated portion of the disc of Venus = 0.982, of Mars = 0.910.
 17. 12h. Mercury at greatest elongation, $18^{\circ} 45'$ East.
 20. 21h. Saturn in conjunction with the sun.
 30. 10h. Venus in conjunction with Jupiter. Venus, $0^{\circ} 44'$ South.
 30. 10h. 22m. Minimum of Algol (β Persei).

MAGNETIC STORMS AND SUN SPOTS.—In an article communicated to No. 4, vol. xvi. of the *Astrophysical Journal*, Father Cortie, S.J., discusses the probable connection between terrestrial magnetic disturbances and solar activity.

Instead of dealing with mean values over an extensive period, he has compared the times of occurrence of specific isolated phenomena which have occurred during the three years 1899-1901, inclusive, and from this comparison has arrived at the conclusion that the relation is certainly not simply one of cause and effect, but rather the relation of two effects springing from a common cause.

For example, in support of this conclusion, the writer analyses the occurrences of the first six months of the past year as follows. The only spot of any size to cross the sun's disc during this period was the one observed between March 5 and 13, yet this was unaccompanied by any striking magnetic disturbance. From March 13 to May 19, the visible disc was completely free from spots, and the faculae observed were faint and unimportant, yet a comparatively vigorous magnetic disturbance took place on April 10.

Father Cortie concludes from his detailed analysis of the last sun-spot minimum that "It may be possible that sun spots are one of the instrumental causes of magnetic storms, though not the only one, but it is more likely that the two phenomena are correlated as two connected, though sometimes independent, effects of a common cause."

OBSERVATIONS OF THE PERSEIDS, AUGUST 10 AND 11, 1902.—In No. 100 of *Popular Astronomy*, Mr. Charles P. Olivier gives the results of the observations of this shower which were made at the Leander McCormick Observatory of the University of Virginia.

On August 10, during a watch which lasted from 9h. 26m. to 16h. 8m., 44 Perseids and 28 other meteors were seen, whilst on August 11 (13h. 38m. to 16h. 8m.) 76 Perseids and 26 other meteors were recorded. The maximum display occurred during the period 13h. 59m. to 14h. 59m. on August 11, 30 Perseids and 11 other meteors being recorded during that hour.

The colour of the brighter Perseids was generally orange, and the radiant points for the two dates were $\alpha = 39^{\circ} 5'$, $\delta = +56^{\circ} 7'$, and $\alpha = 46^{\circ} 8'$, $\delta = +56^{\circ} 7'$ respectively. The latter radiant was very accurately determined from an ap-

parently stationary meteor which appeared directly over the sixth-magnitude star D.M. $+56^{\circ} 798$. The paths of about one-half of the meteors observed were plotted on two charts, reproductions of which accompany Mr. Olivier's article.

THE MOSCOW OBSERVATORY.—Vol. iv. of the second series of the "Annales de l'Observatoire Astronomique de Moscou," published under the editorship of Prof. W. Ceraski, gives all the details and results of the observations made at that observatory since the last similar publication was issued.

During this interval, important work has been done in re-furnishing the observatory and providing it with new instruments, in order that it may pursue its researches on modern lines. A new Henry-Repsold refractor, having two fifteen-inch objectives, has been added to the equipment of the observatory, and one of smaller dimensions is now in course of construction. The meridian circle, which has been in use since 1855, is at present being reconstructed to suit modern requirements.

The results published include the following:—Meridian circle observations, by M. B. Modestow; calculations of occultations by the moon, observations of the Leonid showers of 1897-8-9, and observations of Mars (illustrated by drawings) during 1896 and 1897, by M. S. Blakjo; observations of occultations, by M.M. Sternberg, Modestow and Blakjo; and a photometric study (illustrated by two charts) of Coma Berenices, together with a description of the useful work performed with a binocular, of 15 mm. aperture, by M. Ceraski.

ELECTROCHEMICAL NOTES.

THE literature of electrochemistry and electrometallurgy is rapidly increasing in volume and importance, and busy people find an increasing difficulty in keeping themselves well informed as regards the more recent developments in these new branches of science and industry. The value of periodic subject-indexes of current literature on this subject is therefore very great, and all interested in these new sciences will hail with pleasure the appearance of a monthly sheet entitled *Elektrochemische Technik*, which contains an alphabetical subject-index of all recent articles dealing with applied electrochemistry, electrometallurgy and electrolysis.

This sheet is edited and published by Dr. F. Peters, of Berlin, and the first issue is dated October, 1902. It contains references to 107 recent articles on the subjects covered by the index, and French, German, English and American papers and journals have been searched in compiling this index. In some cases, short abstracts have been given of the articles indexed.

Our issue of May 22 contained a note upon the electric resistance furnaces patented and manufactured by Heraeus, of Hanau, Germany, and the use of such furnaces for melting-point determinations. These furnaces have latterly been reduced in cost and improved in efficiency by the substitution of platinum foil only 0.007 mm. in thickness for the wire originally used, and a recent issue of the *Zeits. f. Elektrochemie* contains some notes by Dr. Haagen—the chemist to the Hanau firm, upon the use of the tube form of the improved furnace for laboratory determinations.

The most important of these for the chemist is the application of the Heraeus furnace to organic elementary analysis, and, according to Dr. Haagen, this application has been attended with success. We suppose that, when used for this purpose, the platinum spiral encircling the glass combustion tube is cut up into several sections, each with its own current connections, so that successive portions of the tube can be heated as desired. The great advantage of such a furnace, from the chemist's point of view, will be the reduction of the heat losses by radiation and by the escaping gases, since these in the usual form of gas-combustion furnace are very great, and in summer time render organic analysis a most trying and tedious operation. Other proposed applications of the Heraeus tube furnaces are for the direct estimation of carbon in steels, and for the determination of ash in coal and coke. The maximum temperature attainable with these furnaces is 1700°C. , and this limit is due to the inability to produce tubes, which will retain their form at this or higher temperatures.

The use of the electric current for heating glass furnaces does not seem a very promising application of electric power to those acquainted with the high degree of efficiency obtained in the modern regenerative gas furnace now generally employed in the glass-making industry. According to a recent issue of the *Zeit.*

Zeitschrift für Elektrochemie, however, this method of heating glass furnaces has not only been the subject of practical experiments in Germany, but two glass works are now in operation, working upon this principle. Two Cologne engineers, MM. Becker and Völker, are the patentees of the more valuable and practical electric furnaces of this type, and after numerous laboratory experiments they have been able to achieve the realisation of their ideas upon an industrial scale. The first "Electric Glass Factory" was built at Plettenberg on the Lenne, where a power station of 2000 E.H.P. was available for the supply of the requisite electric energy. The results first obtained here were not very satisfactory from the economic point of view, but improvements were introduced in the process which are considered to render it a commercial success, where cheap power is available. A new company has therefore been floated, the "Aktiengesellschaft f. Elektrokeramik," and a second electric glass works has been built at Deutsch-Matrei, where electric power can be obtained at a cost of 5 pf. per E.H.P. hour at the terminals of the furnaces. This works was to commence manufacturing operations in the summer of this year, and further details of the results obtained will be awaited with interest.

Messrs. Foerster and Müller, who have devoted much time to the elucidation of the chemistry of the electrolytic chlorate cell, contribute to the *Zeitschrift f. Elektrochemie* of August 28 and September 4 details of an extended laboratory investigation relating to the changes which occur when hypochlorite solutions are electrolysed under various conditions. Sodium hydrate, sodium hypochlorite and sodium chloride solutions were used as electrolytes in their experiments, and the results show that chlorate was formed at the anode both by primary and secondary reactions under the conditions obtaining during their tests. The primary formation of chlorate is represented by the following equation:—



This reaction, however, demands the presence of ClO' ions with anodic free oxygen and an E.M.F. at the anode above 1.1 volts. It occurs under normal conditions only to a slight extent. Secondary chlorate formation occurs at the anode, not only in solutions containing free hypochlorous acid, but also in neutral and alkaline solutions, and may be represented by the following equation:—



The formation of chlorate by this secondary reaction is, however, most active when the conditions admit of the existence of free hypochlorous acid in the electrolyte, *i.e.* when the electrolyte is maintained in an acid condition during the electrolysis. In this connection, it is interesting to note that a recent French patent in the name of Lederlin, relates to an improvement in the usual electrolytic chlorate procedure, the improvement being the continuous addition of dilute hydrochloric acid to the electrolyte in the cell.

The use of ozonised air for the purification of drinking water is again attracting considerable attention. Some years ago, experimental trials were carried out at Paris and other places with processes of this character, but the trials appear to have been unsuccessful (probably on economic grounds), and for two or three years little has been heard of ozone in connection with the water supply of large towns. During the present year, the East London Water Company has, however, been carrying out trials at Lea Bridge with an ozone process of purification, and according to one of our electrical contemporaries, these trials have been fairly successful. Prof. van 't Hoff also gave details at this year's meeting of the German Electrochemical Society of experimental trials recently made with the Vosmaer-Lebret process in Holland, and his paper is fully reported in a recent issue of the *Zeitschrift f. Elektrochemie*. The Vosmaer-Lebret form of ozoniser differs from most of those previously invented in the absence of glass as a dielectric. The silent discharges which produce the ozone in the air passing through the apparatus take place between the walls of the metallic tubes which form its essential feature. An E.M.F. of 10,000 volts with one pole earthed is used, and no artificial cooling is employed. The chemical and bacteriological examination of the water before and after treatment with the ozonised air showed that the reduction in organic matter and in the number of colonies was equal to the best yet obtained by any other process, and Prof. van 't Hoff is of opinion that the Vosmaer-Lebret process may solve the problem of a pure-water supply for large towns and cities.

Experimental trials of the process are shortly to be carried out in Rotterdam, in connection with the town water-works.

The electrolytic separation of antimony from polysulphide solutions of sodium and the metal is a difficult operation, for, owing to the separation of sulphur at the anode and its re-solution in the electrolyte, the metal deposited at the kathode has a strong tendency to enter again into solution. Izart and Thomas have recently been investigating this phenomenon, and have found that the difficulty can be overcome by using a diaphragm type of cell. Some details of their experiments are given in the *Zeits. f. Elektrochemie* of September 11. The solution of polysulphide is placed in the kathode compartment, and a solution of sodium hydrate is used in the anode compartment of the cell. The conductivity of the electrolyte can be increased by the addition of ammonium salts. On passing an electric current through such a cell, sulphur separates at the anode, but dissolves in the sodium hydrate solution with liberation of oxygen. At the kathode, antimony is deposited, and there would appear to be no limit to the thickness of the deposit which can be obtained under these conditions. The process is about to be tried upon an industrial scale at Cassagnac, in France, and the results obtained will be awaited with interest. Up to the present time, the only electrolytic process for the separation of antimony which has been worked upon a large scale is that of Siemens and Halske, but no details of the plant at Banya, in Hungary, have been published, and it is possible that the results have been less satisfactory than the patentees hoped.

A NEW JOURNAL FOR GENERAL PHYSIOLOGY.¹

THE multiplication of journals devoted to particular aspects of the various branches of a science, although indicating the vigorous growth of the last decade, is not without its disadvantages; it tends to accentuate those subdivisions of the subject which specialisation must of necessity bring about. In this respect it is refreshing to realise that the particular periodical now under review aims rather at the consolidation than at the further separation of the different aspects of physiological knowledge. In this and in other respects it is a new departure and as such merits special recognition. This will be apparent to anyone who reads the excellent introduction with which the editor, Prof. Verworn, has prefaced the first number of the new venture and which, apart from its delightful literary style, is well worth perusal since it is more comprehensive than the majority of such utterances; it forms, indeed, in itself a noteworthy and suggestive contribution to contemporary physiological literature. Of the many different points which are dealt with in this editorial, only those can be referred to here which have a direct bearing upon the scope and conduct of the *Zeitschrift für allgemeine Physiologie*. The phrase "General Physiology" has been made familiar through Prof. Verworn's masterly treatise upon the subject, but as this very treatise appears to have given rise to some misconceptions as to the meaning of the terms, the editor now defines the position with more precision. General physiology is regarded by Prof. Verworn to be the science which deals with the objective phenomena of living things in so far as they are common to all or to large groups of organisms. It is noteworthy that the qualification indicated by the word "objective" has been introduced; the reason for this introduction appears to be the desire of the editor to make it clear that in his opinion physical and chemical changes are the only data which can be properly considered to constitute the subject-matter of physiology. His affirmation of this view is particularly salutary at the present time owing to the confusion which exists as to the relation of physiology to psychology; and the modern tendency to blur our sharpness of view in regard to the former subject by reviving the vitalistic views of the past. Prof. Verworn regards with disfavour the intrusion of such idealistic conceptions as have been made familiar by the exponents of "neovitalism," and accordingly he limits the subject-matter of general physiology. He also advocates a more exact phraseology in connection with physiological processes which have been hitherto described by a terminology belonging to psychology. The use of such terms is undoubtedly

¹ *Zeitschrift für allgemeine Physiologie*. Herausgegeben von Dr. Max Verworn. Erster Band, Erstes Heft. Pp. 128 + 28. (Jena: Gustav Fischer, 1902.) Preis Mk. 24.